

# EXPERIENCES IN IRRIGATION REFORMS IN MAHARASHTRA

Suresh A. Kulkarni  
Secretary  
Maharashtra Water Resources Regulatory Authority  
9<sup>th</sup> Floor, WTC- 1, Cuffe Parade, Mumbai  
Phone: 22-22152019; Email: [kulsur@gmail.com](mailto:kulsur@gmail.com)

## ABSTRACT

The ultimate irrigation potential in Maharashtra was estimated at 12.6 million ha, comprising 8.5 million ha by surface water and 4.1 million ha by groundwater. In 2014, about 3.7 million ha were irrigated through surface water and estimated 3 million ha through groundwater. Thus, today less than half of the ultimate irrigation potential is irrigated in the state. Due to increasing population, rapidly growing urbanization and industrialization, the state has been witnessing rising conflicts among irrigation and non-irrigation users, upstream and downstream users, between regions, gravity and lift irrigation schemes, food crops and cash crops, large irrigation projects and small water conservation structures. Irrigation, in particular is facing challenges of low utilization of the created potential, low water use efficiency, poor O & M cost recovery, and overexploitation of groundwater.

To address these issues, the state in 2000 initiated series of policy and institutional reforms in the water sector. The purpose of the water sector reforms is to stimulate efficient water use, accountability, transparency, and financial sustainability. The building blocks of the water sector reforms in the state include preparation of State Water Policy (2003), enactment of Maharashtra Management of Irrigation System by Farmers (MMISF) Act 2005, and Maharashtra Water Resources Regulatory Authority (MWRRA) Act 2005. Other initiatives include preparation of 'Annual Irrigation Status Report', 'Benchmarking Report', and 'Water Audit Report'. In Maharashtra Water Sector Improvement Project (MWSIP) was launched in 2005 with the financial assistance of the World Bank to implement some of these initiatives and reforms. An Integrated State water Plan is under preparation. The Maharashtra Water Resources Development Center was established in 2006 to compile and prepare aforesaid reports on annual basis. In 2011, 'E-JalSeva' an online portal was created to host a wealth of information related to water sector.

Present paper provides a brief of various policy and institutional reforms, major achievements and challenges in their implementation. The reform initiatives have been appreciated by the Central Govt., other states, and international agencies like the World Bank and at international fora. Yet the achievements are far from expectations. It is concluded that there are many hurdles and challenges in implementation of the irrigation reforms and it may take couple of decades to harvest the fruits of these initiatives. There should be a dedicated water bureaucracy, competent professionals, strong political will, vibrant civil society and NGOs actively participating in the consultative process in order to make the reform process successful.

**Key words:** Maharashtra, irrigation reforms, water resources regulatory authority, surface water, groundwater,

## I. INTRODUCTION

Maharashtra is the second highest populated, third largest in area and the second most urbanized as also most industrialized state in India. Agriculture remains the main source of livelihood of about 80 percent of the rural population and provides employment to about 55 percent of the population in the state as well as the bread basket for a growing urban population. As the state is situated in the

semi-arid region, irrigation plays a crucial role in ensuring assured and higher crop productivity. Although there is no physical scarcity of water in the state, except during drought periods, poor water management practices and climate change are adversely impacting the growth and sustainability of irrigated agriculture. About 70-80 percent of the total surface water withdrawals in the state are for irrigation. Since the last decade, the state has been witnessing increasing conflicts among irrigation and non-irrigation users, upstream and downstream users, between regions, gravity and lift irrigation schemes, food crops and cash crops, large irrigation projects and small water conservation schemes. Irrigation, in particular is facing challenges of low utilization of the created potential, low water use efficiency, overexploitation of groundwater, and poor O & M cost recovery.

According to the Stockholm Water Prize Laureate Asit Biswas "if some Asian countries face a water crisis in the future, it will not be because of physical scarcity of water, but because of inadequate or inappropriate water governance, including management practices, institutional arrangements, and socio-political conditions, which leave much to be desired" (ADB, 2007). This paper presents various water/ irrigation sector reform initiatives launched by Maharashtra since 2000, experiences in their implementation, challenges and way forward.

## II. WATER RESOURCES DEVELOPMENT

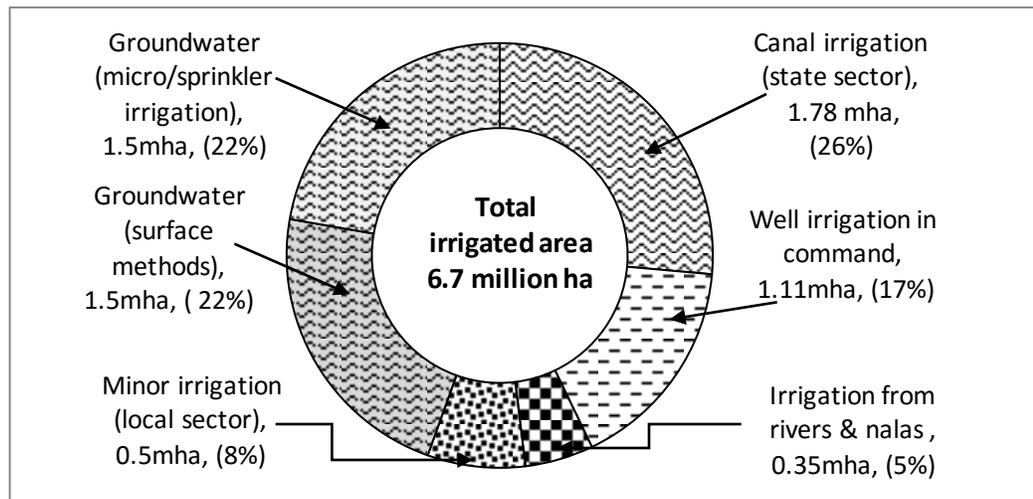
Maharashtra covers five river basins viz., Godavari, Krishna, Tapi, Narmada, and West Flowing Rivers. The first four basins are shared with neighboring states. The average annual water availability in the state is 163.8 billion cubic meters (BCM) and as per the interstate water tribunal awards 126 BCM are allocated to Maharashtra. The annual utilizable water resources considering technical feasibility and financial viability, however, are estimated at 88 BCM comprising 67 BCM as surface water and 21 BCM as groundwater. The water storage capacity created so far through the completed state sector major, medium, and minor projects is 39.4 BCM. In 2014, the actual storages in these projects were about 30 BCM; of which 18 BCM, 3.85 BCM and 0.7 BCM were used for irrigation, domestic and industrial purposes, respectively. Besides state sector, there are more than 69,000 small local sector schemes/ structures (having less than 250 ha of CCA) creating about 8 BCM storages; of which estimated 4 BCM and 0.2 BCM are used for irrigation and domestic purposes, respectively. As regards the groundwater use, of the total draft of about 17 BCM, about 16 BCM (94%) are withdrawn for irrigation and balance 1BCM (6%) for domestic and industrial uses. Thus, presently a total of about 38 BCM are withdrawn for irrigation and 5.8 BCM for non-irrigation purposes. As per Maharashtra Water and Irrigation Commission (MW & IC, 999), the water demand in 2030, both from surface and groundwater is likely to be about 103 BCM comprising 86% for irrigation and 14% for non-irrigation uses. Thus, there is likely to be a serious supply - demand gap of the freshwater over the upcoming one and half decade, unless additional storages are created as also demand management measures are deployed.

In order to accelerate the pace of construction of water resources projects in the state, the government set up Irrigation Development Corporations during 1996 -1998 through statutes one for each of the five major river basins of the state. The Corporations are expected to also act as the River Basin Agencies (RBAs) to recognized by the MWRRA Act and the ISWP is to be prepared by these RBAs and place before the State water Boards. The RBAs shall have the responsibility of the integrated planning, development and management of water resources and flood management.

## III. IRRIGATION DEVELOPMENT

The ultimate irrigation potential in the state was estimated at 12.6 million ha, comprising 8.5 million ha by surface water and 4.1 million ha by groundwater (MW&IC, 1999). In 2014, about 3.7 million ha were irrigated through surface water and about 3 million ha through groundwater. As regards the groundwater irrigation, it is estimated that about 1.5 million ha are irrigated by conventional surface irrigation methods and about 1.5 million ha through drip/sprinkler systems. There is no official data about irrigation from the local sector projects and may be assumed as 0.5 million ha. Thus, there is a scope for doubling the irrigated area in the state. Details of irrigated area from different sources and categories are shown in Figure1. Those areas which cannot be irrigated by gravity are irrigated by lifting/pumping water from rivers, reservoir back water, and canals. Lift irrigation schemes (LIS) can

be categorized as (a) State sector/ Government (b) Cooperative, and (c) Private/ individual. Some 105 government LIS (GLIS) have been planned to create an irrigation potential of 1.1 million ha. The total designed power requirement of these GLIS is 1.05 million HP and an annual planned water use as 6 BCM.



**Figure 1.** Area irrigated by surface and groundwater in 2014 from the state and local sector projects and groundwater in Maharashtra.

Maharashtra is also a leading state in adoption of micro and sprinkler irrigation. A total of 1.9 million ha comprising 1.4 million ha by micro irrigation and 0.5 million ha by sprinkler irrigation were covered in 2015. Groundwater is the major source for all micro and sprinkler irrigation systems. In order to control the excessive use of water for perennial crops like sugarcane, MWRRA, as per the provision in the Act, has made mandatory the use of drip/sprinkler irrigation for perennial crops grown in the canal command area. Initially, eight pilot irrigation projects have been selected to understand the difficulties in their implementation and then upscale those to all perennial crops in the canal command areas across the state.

#### IV. WATER SECTOR REFORMS

As per the Asian Development Bank (2010), water reform includes a variety of processes in the water sector to bring about improvements in response to changing conditions. These can include improvements in policies, legislation, institutional frameworks, organizations, and in forms of communication among all actors concerned. Initiatives to improve water governance are synonymous with water reforms. The purpose of water sector reforms is to stimulate efficient use, induct flexibility, accountability and transparency so as to achieve sustainable development and management of water resources, besides financial sustainability. It enhances the role of stakeholders in decision making process.

To address the issues of growing inter-sectoral water demands, poor performance of the public managed irrigation schemes, equity, low cost recovery, fragmented approach in development and management of water resources, Maharashtra state initiated series of policy and institutional reforms since 2000. The building blocks of the water sector reforms include State Water Policy (2003, as modified in 2011), Maharashtra Management of Irrigation System by Farmers (MMISF) Act 2005, and Maharashtra Water Resources Regulatory Authority (MWRRA) Act 2005. Other initiatives include preparation of 'Annual Irrigation Status Report', 'Benchmarking Report', and 'Water Audit Report'. Subsequently, the Maharashtra Water Sector Improvement Project (MWSIP) was launched in 2005 with the financial assistance of the World Bank to implement some of these initiatives and reforms. The project was aimed to improve irrigation system performance, quality of irrigation service

to farmers and strengthening the participatory irrigation management. An 'Entitlement Programme' on 256 irrigation projects was launched in 2007. Maharashtra Water Resources Development Center was established in 2006 to compile and prepare various reports on annual basis. In 2011, 'E-JalSeva' an online portal was developed wherein not only the WRD staff but also farmers, industrialists, contractors and citizens have access to the wealth of information related to water sector.

Maharashtra is the first State in the country to enact legislation and establish the Water Resources Regulatory Authority (MWRRA) in 2005 as a quasi-judicial entity. The Authority has evolved a rational approach in determining criteria for the bulk water tariff for irrigation, domestic, and industrial uses. There is a steady increase in the volumetric supply and charging of irrigation water to user associations (WUAs), and empowerment of WUAs through Entitlement Programme. MWRRA envisages extension of the entitlement programme to the entire command area, and improvement of irrigation efficiency through adoption of modern water saving irrigation technology like drip and sprinkler irrigation. Presently, some 3400 WUAs are functioning covering about 1.1 million ha of command area.

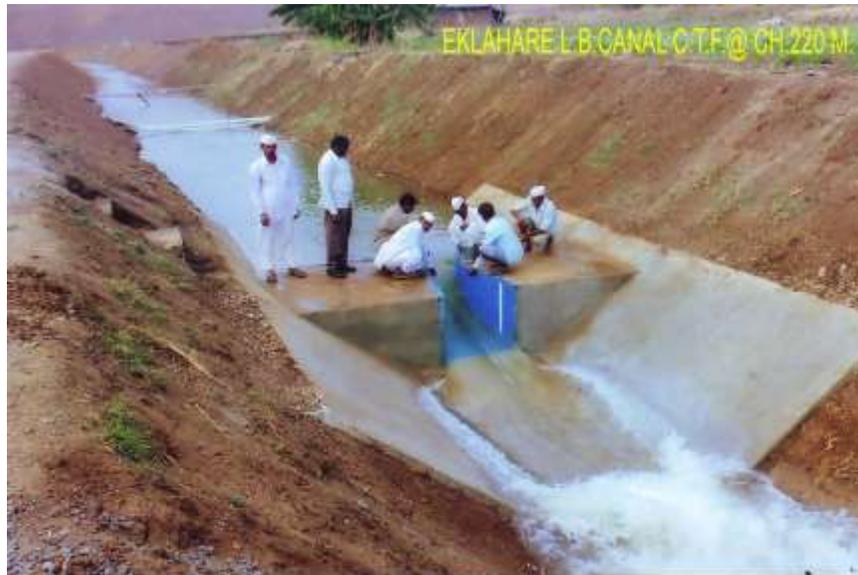
Water Resources Department (WRD) is also preparing an Integrated State Water Plan (ISWP) for each of the five river basins and eventually for the entire state. The ISWP will act as a road map for the sustainable development and management of the state's water resources. The WRD also envisages converting the prevailing Irrigation Development Corporations (IDCs) into River Basin Agencies (RBAs).

Maharashtra is also among the first states in the country to introduce legislation to regulate groundwater development and extraction. In 2009, Maharashtra Groundwater (Development and Management) Act was enacted for sustainable and equitable groundwater supply and regulation with community participation. The Act became operative from 1 June 2014 and MWRRA acts as the State Ground Water Authority (SGWA). The key functions of the SGWA include - issuance of notification of over-exploited, critical, semi-critical watersheds and groundwater quality affected areas, prohibition of extraction and drilling of new/ deep wells, protection and preservation of groundwater quality, monitoring of integrated watershed development and management plan.

As per the prevailing policy, the sectoral allocation from the state sector water projects is decided by the state government. As per the Government Resolution of January 2003, the norms limits for allocation of the live storage (designed) in a reservoir for drinking, industrial, and irrigation uses were decided as 15%, 10%, and 75% respectively. Presently domestic water withdrawal permissions are given to 4680 water user entities (municipal corporations, municipal councils, and grampanchayats) with a total reservation of 5.1BCM (13%); while 732 industrial water user entities (thermal power plants, sugar industries, industrial conglomerations, chemical industries) have reserved 2.1 BCM (5.4%) of water. In case of reduction in the irrigation allocation over and above the norms, the non-irrigation entities are required to compensate the reduction in the irrigation allocation by paying a prescribed amount so as to restore the irrigation area. However, there is no clear policy and methodology about the restoration as yet. The following are some of the key institutional/ policy reform initiatives in irrigation sector in Maharashtra:

**1. State Water Policy:** The Maharashtra State Water Policy was brought out in 2003 with the objectives of ensuring sustainable development, optimal use and management of the water resources to provide maximum economic and social benefits to the people while maintaining the healthy environment. The policy underscores integrated and multi-sectoral approach towards planning, development and management of water resources with river basin/ sub-basin as a unit. The policy recommended institutional restructuring and establishing regulatory frame work in the water sector, deciding water allocation priorities for different uses, transfer of irrigation system management responsibilities to legally empowered water user associations (WUAs), rationalization of water charges and charging on volumetric basis. It calls for setting up of River Basin Agency for each of the five major river basins.

**2. Participatory Irrigation Management:** The concept of participatory irrigation management (PIM) was introduced in Maharashtra in 1980s. Initially, Water User Associations (WUAs) were formed under Cooperative Act, wherein membership of 51% of farmers was required for formation of WUA as also volumetric water supply and charging was not mandatory. Subsequently, in 2005 Maharashtra Management of Irrigation System by Farmers (MMISF) Act was enacted to encourage and expand the PIM and make it more farmers' friendly. Presently, there are a total of 4676 water user associations (WUAs) formed both under the cooperative Act and MMISF Act 2005 covering about 1.86 million ha command area. In 2014, in all 3,417 WUAs, including 2021WUAs formed under MMISF Act, covering 1.36 million ha were reported as functioning. Water Resources Department (WRD) supplies irrigation water on volumetric basis to all WUAs as per their entitlements (Figure 2). The WUAs have freedom to grow crops as per their choice and decide water charges as per the collective decision of their members. In general, the WUAs found to be effective in equitable and efficient distribution of water and also in increasing the water productivity



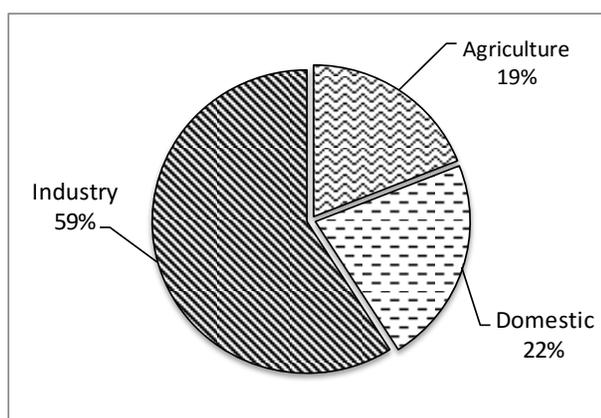
**Figure 2.** A cut throat flume installed at the minor head to measure water volume supplied to WUA

**3. Entitlement Programme:** The term 'Entitlement' is an authorization by the River Basin Agency (RBA) to use water. One of the important functions of the Authority is to determine the criteria for the distribution of entitlements by the river basin agencies, within each category of use after sectoral allocation is made. Ensuring guaranteed water supply to farmers is important for adopting improved on-farm water application and crop production techniques. According to Section 31A of MWRRA (Amendment and Continuance) Act 2011, the term 'Entitlement' shall apply to those areas which comply with all relevant provisions including delineation under MMISF Act 2005. In order to cover an irrigation scheme under entitlement programme, the pre-requisite is that the WUA should be in a position to takeover irrigation management and a flow measuring device should be installed at the head of the water supply channel (minor).

Beginning with six pilot irrigation projects in 2006, the programme has now been up-scaled to include 256 projects and 1368 Water User Associations (WUAs). Water is supplied and charged on volumetric basis to these WUAs. The enforcement of the programme consists of fixing, issuance, regulation, delivery and monitoring of the entitlements. The regulators are appointed on behalf of the Authority to check the delivery of entitlements and maintenance of related records during irrigation rotations. Monitoring is carried out on the basis of feedback submitted by River Basin Agency/ Irrigation Development Corporation (RBA / IDC) in the prescribed format at the end of the irrigation season. Regional workshops are held prior to the commencement of Rabi season to discuss the

difficulties/experiences among WRD officials, managerial staff of WUAs, and Regulators in implementation of the programme.

**4. Water Pricing:** Prior to 2010, the water rates in Maharashtra were decided by the Water Resources Department (WRD) on an ad-hoc basis. The chief objective of the water charging has been the recovery of the operation and management (O & M) expenses of the irrigation projects. MWRRA, for the first time has developed a rational approach for determining the criteria for bulk tariff system for agricultural, domestic and industrial uses. The first edition of the bulk tariff for the period 2010-13 was introduced in 2011. Subsequently, the second bulk water tariff criteria for the period 2013-16 was prepared and send to the WRD for its proposal. A unique process of preparing a matrix and allocating weightages for the selected parameters viz., affordability, accessibility, quantity and timeliness, and impact on water quality was adopted to distribute the cost of O & M among various user categories. As per the 2<sup>nd</sup> tariff proposal, agriculture (irrigation), domestic, and industrial users will share 19%, 22%, and 59% of the total O & M cost (Figure 3). The O & M cost, including the establishment cost of irrigation projects, the water charges levied and recovery from irrigation and non-irrigation users is shown Table 1.



**Figure 3.** Allocation of water charges to agriculture, domestic and industrial sectors

**Table1.** The O & M cost, assessment of water charges, and recovery in Maharashtra

S.No.	Year	Expenditure on O & M cost (Including establishment charges)	Assessment of irrigation and non-irrigation water charges	Recovery of water charges			Percentage of recovery to the assessment (6/4)	Percentage of recovery to O & M cost (7/3)
				From arrears	From assessment	Total		
1	2	3	4	5	6	7	8	9
1	2004-2005	376	497	98	350	448	70	119
2	2005-2006	453	418	84	329	413	79	91
3	2006-2007	416	499	91	403	494	81	119
4	2007-2008	466	674	99	548	647	81	139
5	2008-2009	555	808	70	603	673	75	121
6	2009-2010	709	811	165	638	803	79	113
7	2010-2011	745	767	174	572	746	75	100
8	2011-2012	765	651	128	492	620	76	81
9	2012-2013	762	753	66	440	506	58	66
10	2013-2014	843	607	58	457	515	75	61

Determination of the criteria for the bulk water tariff is a complex and lengthy process. Consultations with the stakeholders for seeking their views are an integral part of the tariff exercise towards ensuring its successful implementation. NGOs/ Civil Society play an important role in providing the critical feedback in the process and reflecting the stakeholders' views. The concept of bulk water tariff is a step forward in irrigation water pricing. The matrix developed to factor the impact of various parameters on water rates is a unique approach as it is based on the stakeholders consensus and in a transparent manner.

**5. Maharashtra Water Resources Regulatory Act:** MWRRRA was established to regulate water resources, facilitate and ensure judicious, equitable and sustainable management, allocation and utilisation of water resources, fix the rates for use of water for agriculture, industrial, drinking and other purposes and matters connected therewith or incidental there to (MWRRRA Act, 2005). The Act was amended in 2011. The following are the key functions of the Authority:

- to determine the criteria for the distribution of entitlements by the River Basin Agencies, within each category of use, after sectoral allocation is made by the Government,
- to determine the priority of equitable distribution of water available at the water resources project, sub-basin and river basin levels during periods of scarcity,
- to establish a water tariff system, and to fix the criteria for water charges at sub-basin, river basin and state level after ascertaining the views of the beneficiary public, based on the principle that the water charges shall reflect the full recovery of the cost of the irrigation management, administration, operation and maintenance of water resources project,
- to review and clear water resources projects proposed at the sub-basin and river basin level to ensure that a proposal is in conformity with the Integrated State Water Plan,
- To support and aid the enhancement and preservation of water quality within the State, and
- To promote and implement sound water conservation and management practices throughout the state.

The Authority has been vested with a special responsibility with regard to clearing projects in districts and regions with irrigation backlog as per the Governor's directives. The Authority is also required to function as a quasi-judicial body to handle and dispose of petitions relating to review of tariff and entitlements. The Authority is the appellate body for disputes concerning the entitlements.

**6. Maharashtra Management of Irrigation System by Farmers Act:** The main features of the MMISF Act are- water will be supplied only to WUAs and on volumetric basis, WUAs will have freedom for cropping pattern and the tail-enders are assured of water supply. Representation of women in the management of WUA is made compulsory. Procedure of registration has been simplified as it is to be done at WRD level. All the farmers under WUA area automatically become its members. However, the command area of the project has to be first delineated in order to form WUAs under MMISF Act. Rehabilitation works of distribution network to ensure adequate and timely delivery of irrigation water are carried out by the WRD. However, due to lack of funds the delineation/ rehabilitation works are not being taken up. This is hampering the expansion of WUAs in the state.

**7. Groundwater Regulation Act:** In Maharashtra, annually some 17 BCM of groundwater is pumped through over 2.5 million wells. About 94% of the groundwater is used for irrigation and 6% for industries and domestic purposes. Groundwater is the major source of drinking water in rural areas. It also sustains flow of natural streams. The state is facing the problem of rapid depletion of groundwater resources due to proliferation of wells (dug and bore wells) and over exploitation. Presently, of the 1531 watersheds 76 are overexploited and 4 watersheds are critical.

The Maharashtra State Legislature enacted the Maharashtra Groundwater (Development & Management) Act 2009 (which received President's assent in 2013) to regulate and manage the groundwater resources of the state. The Act empowers the MWRRA to also act as the State Groundwater Authority. The Authority is implementing the provisions of the Act in co-ordination with the Water Supply and Sanitation Department (WS&SD) and the Groundwater Survey and Development Agency (GSDA). The framing of rules for the implementation of the Act and preparation of an 'Approach Paper' for notifying over-exploited watersheds are in progress. Maharashtra is also among the first states in the country to introduce legislation to regulate groundwater development and extraction. In 2009, Maharashtra Groundwater (Development and Management) Act was enacted for sustainable and equitable groundwater supply and regulation with community participation. The Act became operative from 1 June 2014 and the MWRRA also acts as the State Ground Water Authority (SGWA). The key functions of the SGWA include - issuance of notification of over-exploited, critical, semi-critical watersheds and groundwater quality affected areas, prohibition of extraction and drilling of new deep wells (> 60m.), protection and preservation of groundwater quality, monitoring integrated watershed development and management plan.

**8. Integrated State Water Plan:** The objectives of the Integrated State water plan ((ISWP) are- to prepare a long term plan for the development of the basins' surface and groundwater resources, to identify and set priorities for promoting water resources development projects, to formulate a short term action plan consistent with financial allocations and priorities of the government, to identify steps to promote water conservation and preservation vis-a-vis enhancement of water quality. Water Resources Department (WRD) is preparing an Integrated State Water Plan (ISWP) for each of the five river basins and for the entire state. A basin plan for Godavari basin has been prepared and was publically debated. Preparation of Krishna river basin plan is at the advance stage and water plans for other basins is in progress.

#### **9. Irrigation status report**

Irrigation Status Report provides updated and comprehensive information/ data of key aspects of water resources development and management. It cover detailed data on basin-wise, region-wise, project-wise water storages, irrigation potential created and utilization, season-wise water use for irrigation and non-irrigation purposes, evaporation losses, water use efficiency, cropped area and crop yields, status of formation of WUAs, assessment and recovery of water charges, etc. The status report is published annually and is widely circulated among stakeholders. Over the last five years, the report has been published every year. This initiative has elicited transparency and accountability amongst department personnel.

#### **10. Benchmarking report**

Benchmarking is a management tool generally used in private sector for improving the system performance and productivity. The state took up the benchmarking of irrigation projects for improving their performance. Maharashtra is the first state in India to launch this initiative. Commencing from 2002, the Benchmarking Report is published annually. Commencing with 84 projects in 2002, it was extended to 261 irrigation projects in 2004 and to all major and medium projects since 2005 onwards. Benchmarking enables comparison of the performance of irrigation projects within and outside the region. Performance is evaluated using various technical, agricultural, economic, and social indicators. Benchmarking exercise has enthused competitive spirit among project authorities towards improvement of project performance.

**11. Water Audit Report:** Water auditing is a systematic compilation of water withdrawals and use for different uses from the state sector projects. The water audit report provides information on – water storages in the reservoirs, season-wise water use for irrigation (flow as well as lift), water use for non-irrigation purpose, evaporation from reservoirs, water losses in conveyance network, season wise area irrigated and water use efficiency. The actual data is compared with the designed/ planned. The discrepancies, if any are brought to the attention of the concerned Superintending Engineer for undertaking suitable corrective measures. The water audit is an effective tool for the

irrigation managers for deciding an appropriate measures for minimizing losses, optimizing various uses and eventually saving water.

## V. WAY FORWARD

With the increase in investments in the irrigation sub-sector there is a need to introduce institutional and policy reforms in tandem with infrastructure development. In India, importance of regulation of the water sector is steadily being appreciated by the Central Government, and other states. Presently, water resources development and management is dealt by several government departments in a piecemeal fashion. The WRD is a major custodian and service provider of the state's surface water resources. The reform initiatives of Maharashtra have been commended by international agencies like the World Bank and at international fora. Its implementation has resulted in improvement in water use efficiency. Maharashtra is the first state in India to enact legislation and establish the Water Regulatory Authority (MWRRA) in 2005 as a quasi-judicial entity. The Authority has evolved a rational approach of determining criteria for the bulk water tariff for irrigation, domestic, and industrial uses. There is a steady increase in the volumetric supply and charging of irrigation water to WUAs and their empowerment through Entitlement Programme. MWRRA envisages extension of the entitlement programme to the entire command area and improvement of irrigation efficiency through adoption of modern water saving and crop productivity increasing irrigation technology like drip and sprinkler. It is hoped that the experiences of the MWRRA in determination of the criteria for bulk water tariff, fixing of bulk water entitlements, equitable distribution of water in a sub-basin will be useful to other states of India.

Reforms are not accepted always by all, as those stakeholders who have been over exploiting/ abusing the prevailing situation show displeasure with the new initiatives. For example, upstream or head reach stakeholders strongly resist sharing water with their fellows on downstream or tail reach. Other related line departments feel the Regulatory Authority as an encroachment and unnecessary intervention in their affairs and are reluctant to cooperate whole heartedly. Entitlement programme is still grappling to realize its true objective. Presently, only about 13 percent of the total water supplied to irrigation is provided and charged on volumetric basis and remaining is still being charged on area basis. Participatory irrigation management through WUAs is not being up-scaled as expected despite strong legislative support.

In order to effectively implement the various reform initiatives, a paradigm shift in the water management culture is needed. A focus on specialization and interdisciplinary team approach in water management is called for. There is a need to have forum(s)/ platform(s) for water professionals, academic/research institutions and industry professionals to share good practices, concerns and evolve solutions to the problems. More and more engineers/ irrigation managers and bureaucrats need to be exposed to the latest irrigation technology and best water management practices in other states and countries. They should be prepared to understand the intricate and complex challenges of the water sector. All reform initiatives should lead to improvement in system performance, higher water and crop productivity, financial returns, and environmental sustainability.

Water sector is dominated by the government and more than technical issues, socio-political system dominates the decisions. However, as the competition for the limited freshwater resources of the state is escalating, the state will have to push the reform agenda and address the challenges for averting the adverse impacts of looming water scarcity through effective governance. The present hardware focused approach need to be replaced by more pragmatic, inclusive, and participatory approach. Merely making policies and introducing reforms is not enough unless these are translated into actions. Water issues are location specific and vary from project to project, and basin to basin and therefore solutions have to be site specific. Yet, we need to be patient and improve upon and not to lose the hope. Worldwide experience also shows that water reforms take place at slow pace over decades even in the advanced countries.

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